REMARKS

Claims 146-171, 173, and 175-219 are pending in the above-identified application. Claims 171, 173, 175, 176 and 206-219 were rejected. With this Amendment, independent claims 171, 206, 211, and 215 are amended. Accordingly, claims 146-171, 173, and 175-219 remain at issue.

I. 35 U.S.C. § 112 ¶ 1 Written Description Rejection of Claims

Claims 206-209 were rejected under 35 U.S.C. § 112, ¶ 1, as allegedly failing to comply with the written description requirement. In particular, the Examiner alleges that there is no support in the embodiment of Figure 6 for a cap layer having a band gap always larger than that of the p-type clad layer, as recited in claim 206. Applicants respectfully traverse this rejection.

While Applicants respectfully do not agree with the Examiner's interpretation of this limitation as found on page 9 of the Office Action, Applicants have amended the limitations to clarify that the cap layer at all points has a band gap that is larger than that of the p-type clad layer.

Applicants respectfully submit that Figure 7 fully discloses that the cap layer at all points has a band gap that is larger than that of the p-type clad layer. Figure 7 is a schematic diagram showing an energy band structure of the GaN compound semiconductor laser according to the fifth embodiment, i.e., the embodiment depicted in Figure 6. Figure 7 clearly shows the discontinuous band levels of the embodiment, with the band gap correlating to 9(p), the p-type cap layer, as always larger the band gap correlating to 18(p), the p-type clad layer. Thus, this limitation is plainly disclosed in Figure 7 and is sufficient to satisfy the written description requirement. Accordingly, Applicants respectfully request withdrawal of this rejection.

II. 35 U.S.C. § 103 Obviousness Rejection of Claims

Claims 171, 173, 175-176, and 206-219 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over *Schetzina* (U.S. Patent No. 5,670,798) in view of *Ibbetson et al.* (U.S. Patent No. 6,515,313). Applicants respectfully traverse this rejection.

Claim 171, as amended, is directed to a semiconductor light emitting device comprising an active layer, an optical guide layer in contact with the active layer, a cap layer in contact with the optical guide layer, and a p-type clad layer in contact with the cap layer. The p-type clad layer is effective to confine light from the active layer. The cap layer at all points has a band gap larger than that of the p-type clad layer, but the thickness of the cap layer is equal to or more than 2 nm and equal to or less than 20 nm. It is submitted that within that thickness range, the cap layer is insufficient to confine light from the active layer effectively.

Schetzina discloses an active layer in contact with a cladding layer 114a, which is in turn in contact with an ohmic contact having a graded layer 122a. *Schetzina* also discloses, in Fig. 30, that in the case of laser diodes, light guiding layers may be disposed between the active layer and the cladding layer. It is apparent that this cladding layer 114a has a thickness that allows it to effectively confine light from the active layer. *Schetzina*, at no time, discloses or suggests the use of a cap layer between the active layer and the cladding layer. Also, as acknowledged by the Examiner, *Schetzina* does not disclose or suggest that the thickness of the cap layer is equal to or more than 2 nm and equal to or less than 20 nm.

Additionally, because *Schetzina* does not disclose the cap layer, *Schetzin*a necessarily does not disclose or fairly suggest a cap layer with a band gap greater than that of the p-type cladding layer..

The Examiner asserts that cladding layer AlGaN 114a of *Schetzina*, in view of *Ibbetson*, discloses the cap layer of the claimed invention. However, a cladding layer is a term of art, and it is clear that the cladding layer AlGaN 114a of *Schetzina* has a different structure and function than the cap layer of the claimed invention.

Cladding layers serve the function of confining irradiated light from an active layer, and it is well-known that cladding layers have thicknesses in the order of microns rather than in the order of nanometers. As disclosed in Casey, H.C. and Panish, M.B., *HETEROSTRUCTURE LAYERS* (copy attached), the thickness of the cladding layers must be "sufficiently large to prevent the interfaces with the p^+-GaAs contact layer or the n^+ substrate from influencing the optical fields." (See page 33, line 13 through page 34, line 3). At minimum, cladding layers are typically 200nm - 500nm in thickness. Cladding layers serve the function of confining irradiated light from the active layer, and so they must be sufficiently thick to confine the light.

In Casey and Panish, Fig. 2.5-10(a) illustrates that the electric field expands in the range of sub-micron for structures made of GaAs based materials. One skilled in the art could easily analogize the results with regard to GaAs based materials into the case of GaN based materials. Thus, the thickness of cladding layers sandwiching an active layer should be at least in the sub-micron order in the case of GaN based materials. Accordingly, one skilled in the art manufacturing a device according to the disclosure in *Schetzina* would not consider using cladding layer 114a with a thickness equal to or more than 2 nm and equal to or less than 20 nm.

The Examiner cites to *Ibbetson* as evidence that a cladding layer may be in the range of 2 nm - 20 nm. However, the cladding layer in *Ibbetson* would not be able to replace the cladding layer in *Schetzina* because it would not effectively confine light irradiated from the active layer, as claimed, and therefore is not combinable with *Schetzina*.

A cladding layer of the thickness in *Ibbetson* does not effectively confine light of an active layer. It follows that the cladding layer of *Ibbetson* cannot be substituted into *Schetzina* because it would not work, i.e., it would not confine light as the *Schetzina* structure requires. Accordingly, *Schetzina* in view of *Ibbetson* does not disclose or suggest the presence of a cap layer or an equivalent element, in structure or function. Applicants respectfully submits that the Examiner's position is untenable, and should be withdrawn.

Moreover, the Examiner asserts that the *Schetzina* ohmic contact having a graded layer 122a has an equivalent structure to the p-type clad layer of the claimed invention. However, an ohmic contact, like a cladding layer, is a term of art, and the cladding layer of the claimed invention has an altogether different structure and function from the ohmic contact having a graded layer 122a in *Schetzina*.

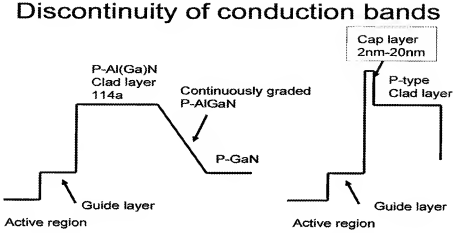
Ohmic contacts typically are metal to semiconductor junctions that serve the purpose of carrying electrical current into and/or out of the semiconductor. Usual ohmic contacts on semiconductors are sputtered evaporated metal pads that are patterned using photolithography. Low-resistance, stable contacts are critical for the performance and reliability of integrated circuits and their preparation and characterization are major efforts in circuit fabrication.

As is evident from Figure 7 of the present application, the clad layer 18(p) of the claimed invention is not an ohmic contact at all, and especially not one with a linear grade, but rather

serves to confine the light irradiated from the active layer. Applicants respectfully submit that the cladding layer and ohmic contact of *Schetzina* should not and cannot simply be redefined by the Examiner as the cap layer and clad layer, respectively, of the claimed invention, when the structure and function of the claimed elements are not present in *Schetzina*, in view of *Ibbetson*.

Moreover, claims 171, 206, 211 and 215 all specify that the cap layer has a band gap that at all points is larger than that of the p-type clad layer. In *Schetzina*, the band gap of continuously graded layer 122a equals the band gap of cladding layer 114a at the point where the two parts meet. (See col. 10, lines 50-54). Thus, *Schetzina* does not disclose or suggest that the cap layer has a band gap that is always larger than that of the p-type clad layer, as required by these claims.

To further illustrate the differences between the structure envisioned by the combination of *Schetzina* in view of *Ibbetson*, as proposed by the examiner, the following drawing is provided. The left-hand graph shows the band gaps across the layers of the proposed device. The right-hand graph shows the band gap of the presently claimed device.


Discontinuity of conduction bands
P-Al(Ga)N
Clad layer
114a
Continuously graded
P-AlGaN
P-GaN
Guide layer
Active region
Cap layer
2nm-20nm
P-type
Clad layer
Guide layer
Active region
Schetzina's invention
Fig.3 and Fig.8A
Our invention

As is clear, the band gap of the cap layer of the presently claimed structure is distinctly greater than the band gap of the p-type clad layer at all points.

For all of the reasons set forth above, Applicants respectfully submit that independent claims 171, 206, 211, 215, and their respective dependent claims, are allowable over *Schetzina* in view of *Ibbetson* Accordingly, Applicants respectfully request withdrawal of this rejection.

III. Conclusion

In view of the above amendments and remarks, Applicants submits that all claims are clearly allowable over the cited prior art, and respectfully request early and favorable notification to that effect.

Respectfully submitted,

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